PSet 2: **Fluids**

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1 Pressure and velocity relationship

Gas flows through the pipe of the figure below. You can't see into the pipe to know how the inner diameter changes. Rank in order, from largest to smallest, the gas speeds v_a, v_b, and v_c at points a, b, and c. Explain.

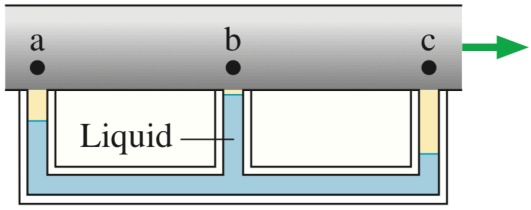

Figure 1: Gas pipe

2 Bernoulli's principle

Show that Bernoulli's principle is just another statement of conservation of energy.
Hint: What is the relationship between force and energy?

3 Hydraulic lift

Derive the equation for the hydraulic lift.

4 Fluid dynamics

(i) A 1.0-cm-diameter pipe widens to 2.0 cm, then narrows to 5.0 mm. Liquid flows through the first segment at a speed of 4.0 m/s.

(a) What is the speed through the second and third segments?

(b) What is the volume flow rate through the pipe?

(ii) What does the top pressure gauge read in the figure below?